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BAKER (MICHAEL) JR INC BEAVER PA
NATIONAL DAM SAFETY PROGRAM. SOUTH RIVER DAM NUMBER 27, (VA 015--ETC(U)
SEP 78 M BAKER

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DACW65-78-D-0016

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POTOMAC RIVER BASIN

Name Of Dam: SOUTH RIVER NO. 27

Location: AUGUSTA COUNTY, STATE OF VIRGINIA

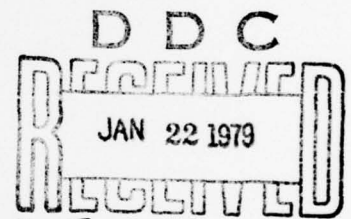
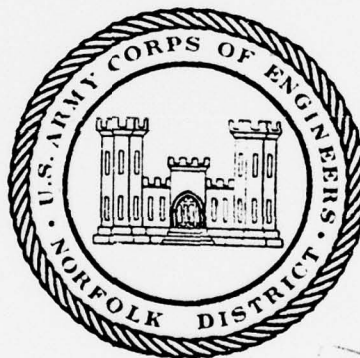
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PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM



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PREPARED FOR

NORFOLK DISTRICT CORPS OF ENGINEERS

803 FRONT STREET

NORFOLK, VIRGINIA 23510

SEPTEMBER 1978

BY

MICHAEL BAKER, JR., INC.

BEAVER, PENNSYLVANIA 15009

79 01 16 203410795

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER VA 01503	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Phase I Inspection Report National Dam Safety Program South River No. 27 Augusta County, State of Virginia		5. TYPE OF REPORT & PERIOD COVERED Final / kept
7. AUTHOR(s) Michael Baker, Jr. Michael Baker III		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS		8. CONTRACT OR GRANT NUMBER(s) DACW 65-78-D-0016
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Engineering District, Norfolk 803 Front Street Norfolk, VA 23510		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
14. MONITORING AGENCY NAME & ADDRESS (If different from Controlling Office) 1264 p.		12. REPORT DATE September 1978
		13. NUMBER OF PAGES 65
		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report) National Dam Safety Program. South River, Number 27 Dam, Number (VA 01503), Potomac River Basin, Augusta County, State of Virginia. Phase I Inspection Report.		
18. SUPPLEMENTARY NOTES Copies are obtainable from National Technical Information Service, Springfield, Virginia 22151		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Dams - VA National Dam Safety Program Phase I Dam Safety Dam Inspection		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) (See reverse side)		


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20. Abstract

Pursuant to Public Law 92-367, Phase I Inspection Reports are prepared under guidance contained in the recommended guidelines for safety inspection of dams, published by the Office of Chief of Engineers, Washington, D. C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general conditions of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

Based upon the field conditions at the time of the field inspection and all available engineering data, the Phase I report addresses the hydraulic, hydrologic, geologic, geotechnic, and structural aspects of the dam. The engineering techniques employed give a reasonably accurate assessment of the conditions of the dam. It should be realized that certain engineering aspects cannot be fully analyzed during a Phase I inspection. Assessment and remedial measures in the report include the requirements of additional indepth study when necessary.

Phase I reports include project information of the dam and appurtenances, all existing engineering data, operational procedures, hydraulic/hydrologic data of the watershed, dam stability, visual inspection report and an assessment including required remedial measures.



PHASE I INSPECTION REPORT NATIONAL DAM SAFETY PROGRAM

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NAME OF DAM: SOUTH RIVER NO. 27

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: South River No. 27
State: Virginia
County: Augusta
Stream: North Fork Back Creek
Date of Inspection: 11 July 1978

BRIEF ASSESSMENT OF DAM

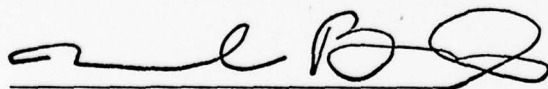
South River Dam No. 27 is an earth dam approximately 950 feet long and 60 feet high, owned and operated by the U.S. Forest Service, and designed by the U.S. Soil Conservation Service on the South River watershed as part of the Potomac River Watershed Project. The visual inspection and review of engineering data, made in July and August 1978, indicate no deficiencies requiring immediate attention.

The emergency spillway will pass the Probable Maximum Flood without overtopping the dam. Visual observation during inspection indicated no evidence of instability, and a stability analysis done during design showed a sufficient factor of safety. However, the circular arc method of stability analysis was not performed for the design.

It is recommended that a circular arc stability analysis be done to check the stability of the earth embankment. The following remedial measures are also recommended: repair downstream slope erosion, remove trees from the embankment, fill animal burrows, drain the berm on the downstream embankment slope, clean the left subdrain outlet, reline the stilling basin with riprap, remove debris from the trash racks, repair steel and concrete sections of the riser, and check the operation of the riser slide gate.

MICHAEL BAKER, JR., INC.

SUBMITTED:

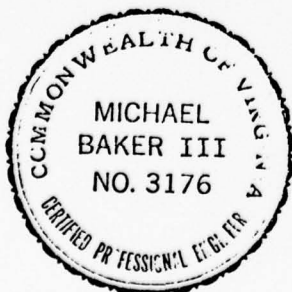


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Zane M. Goodwin
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APPROVED:

Douglas L. Haller
Colonel, Corps of Engineers
District Engineer

Date: _____

NAME OF DAM: SOUTH RIVER NO. 27



OVERALL VIEW OF DAM

OVERALL VIEW OF DAM

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
NAME OF DAM: SOUTH RIVER NO. 27 ID# VA 01503

SECTION I - PROJECT INFORMATION

1.1 General

- 1.1.1 Authority: Public Law 92-367, 8 August 1972, authorized the Secretary of the Army, through the Corps of Engineers to initiate a national program of safety inspections of dams throughout the United States. The Norfolk District has been assigned the responsibility of supervising the inspection of dams in the Commonwealth of Virginia.
- 1.1.2 Purpose of Inspection: The purpose is to conduct a Phase I inspection according to the Recommended Guidelines for Safety Inspection of Dams. The main responsibility is to expeditiously identify those dams which may be a potential hazard to human life or property.

1.2 Description of Project

- 1.2.1 Description of Dam and Appurtenances: South River Dam No. 27 (Upper Sherando Lake Dam) is an earthfill structure about 950 feet long and 60 feet high. The top of the dam is 17 feet wide and is at elevation 1950.0 feet above Mean Sea Level (M.S.L.). Side slopes are two and one-half horizontal to one vertical (2.5:1) seepage control is provided by an impervious core key way extending one foot into bedrock. A toe drain outletting adjacent to the outlet pipe has been provided (Photo 1).
- The emergency spillway (Photo 2) is a vegetated, rock-cut, side-channel type with a bottom width of 160 feet. It has side slopes of 3:1 and 2.5:1, respectively. The crest of the emergency spillway is at elevation 1942.7.
- The primary spillway consists of a standard fixed crest riser with a 30 inch reinforced concrete pipe as a discharge conduit. The discharge is controlled by the fixed crest at normal pool elevation (1910.0 feet). The reservoir may be drained by the use of a hand operated, 30 inch slide gate. A plan and typical section of the dam are shown on Plates 1 and 2.

NAME OF DAM: SOUTH RIVER NO. 27

- 1.2.2 Location: South River Dam No. 27 is located on North Fork Back Creek about six miles upstream from Sherando, Virginia.
- 1.2.3 Size Classification: The dam is in the "intermediate" size category as defined by the Recommended Guidelines for Safety Inspection of Dams. The maximum height of the dam is 60 feet and the reservoir capacity to the top of the dam is 763.5 acre-feet.
- 1.2.4 Hazard Classification: The dam is located immediately upstream of a public campground and less than one-half mile upstream of Sherando Lake Dam. The Town of Sherando lies about five miles downstream of Sherando Lake. Therefore, with the possibility of loss of life not only in the campground but also in the Town of Sherando; South River Dam No. 27 has been given a "high" hazard classification in accordance with Section 2.1.2 of the Recommended Guidelines for Safety Inspection of Dams. The hazard classification used to categorize dams is a function of location only and has nothing to do with its stability or probability of failure.
- 1.2.5 Ownership: The dam is owned by the United States Forest Service.
- 1.2.6 Purpose: The purpose of the dam is for flood control.
- 1.2.7 Design and Construction History: The dam was designed and constructed under the supervision of the U.S. Soil Conservation Service (S.C.S.). Construction was completed in 1958.
- 1.2.8 Normal Operational Procedures: No formal operating procedures are followed on this dam. Normal pool is controlled by the riser (Photo 3) crest elevation of 1910.0 feet. Water rising above the crest of the drop-inlet is automatically passed downstream. Excess flows are diverted through the side-channel emergency spillway. The 30 inch slide gate is not periodically operated.

NAME OF DAM: SOUTH RIVER NO. 27

1.3 Pertinent Data

1.3.1 Drainage Area: The dam controls a drainage area of 1825 acres (2.85 square miles).

1.3.2 Discharge at Dam Site: Maximum flood at the dam site is not known.

Principal Spillway:

Pool level at emergency

spillway crest 125 c.f.s.

Pool level at top of dam 134 c.f.s.

Emergency Spillway:

Pool level at top of dam 9,200 c.f.s.

1.3.3 Dam and Reservoir Data: Pertinent data on the dam and reservoir are shown in the following table:

TABLE 1.1 DAM AND RESERVOIR DATA

Item	Elevation feet M.S.L.	Area acres	Reservoir			Length feet
			Capacity			
			Acre- feet	Watershed inches(a)		
Top of dam	1950.0	30.9	763.5	5.02	-	
Maximum pool, design surcharge	1948.3	29.8	716.5	4.71	3160	
Emergency spillway crest	1942.7	25.9	558.5	3.67	2790	
Principal spillway crest (b)	1910.0	9.0	35.5	0.23	900	
Streambed at center- line of dam	1898 <u>+</u>	-	-	-	-	

(a) Based on 2.85 square miles of watershed area.

(b) Top of conservation pool and bottom of flood control pool.

NAME OF DAM: SOUTH RIVER NO. 27

SECTION 2 - ENGINEERING DATA

2.1 Design: The design data reviewed included the following:

- 1) Photocopies of as-built plans by the S.C.S.
- 2) Photocopy of the hydrologic and hydraulic calculations.
- 3) Laboratory soil test results including:
 - a) Atterberg Limits.
 - b) Gradation test results.
 - c) Proctor test results.
 - d) Specific gravities.
- 4) Geologic Report (Appendix VI).
- 5) Dam Stability Analysis (Appendix VII).

All existing data has been filed with the Norfolk District for future reference.

2.2 Construction: No construction records were available for inclusion in this report.

2.3 Operation: There are no formal operating procedures for a flood control dam of this type. The emergency spillway has been activated twice since construction. The reservoir crested at elevation 1944.5 in 1969 and elevation 1943.3 in 1972. The slide gate used to drain the reservoir is not periodically operated.

2.4 Evaluation

2.4.1 Design: The as-built drawings were adequate for evaluating the overall condition of the dam. Foundation conditions were determined using the foundation and geologic reports. The hydrologic and hydraulic data provided was adequate for design review.

However, the wedge type method of stability analysis used in the design is not appropriate for a homogeneous earth embankment. The circular arc (Swedish Circle) method should be used to check the embankment stability according to Section 4.4.3.2 of the Recommended Guidelines for the Safety Inspection of Dams. Dam stability is discussed in detail in Section 6 of this report.

NAME OF DAM: SOUTH RIVER NO. 27

- 2.4.2 Construction: As-built plans of the dam were provided by the S.C.S. No other construction records were available.
- 2.4.3 Operation: The operational procedures are adequate for the flood control facility. However, the slide gate should be periodically operated.

NAME OF DAM: SOUTH RIVER NO. 27

SECTION 3 - VISUAL INSPECTION

3.1 Findings

3.1.1 General: The field inspection was conducted on 11 July 1978. No unusual weather conditions were experienced and the water level was 0.2 foot above the normal pool elevation 1910.0. The dam and appurtenant structures were found to be in good overall condition at the time of the inspection. The problems noted during the visual inspection are considered minor with the exception of minor erosion and small tree growth on the embankment. Noteworthy deficiencies observed are described briefly in the following paragraphs. The complete visual inspection check list is given in Appendix III.

3.1.2 Dam: Minor erosion damage was observed on the dam embankments during the field investigation. Footpaths traverse the upstream and downstream faces of the dam, which have continually eroded because of the lack of vegetative cover. The erosion along one such footpath, on the downstream berm, has resulted in sediment being deposited on the berm which is meant to collect and control runoff, and minimize erosion. The sediment that has collected on the low point of the downstream berm, down slope of the footpath, prevents normal conveyance of water.

Small trees (approximately six feet high) were observed growing on both faces of the dam. Two large animal burrows are located on the downstream face of the dam slightly above the outlet conduit. Another animal burrow is located immediately adjacent to the seepage drain outlet on the north side of the principal spillway outlet. The rubble tossed aside from this burrow has blocked the outlet of this seepage drain.

3.1.3 Appurtenant Structures: At the time of the inspection, a small amount of debris was lodged in the trash rack at normal pool.

All exposed steel on the riser (trash rack, cover plate, and gate operating pedestal) has a moderate to heavy coating of surface rust.

NAME OF DAM: SOUTH RIVER NO. 27

Four, short, concrete columns (10 inches square) which support the nine inch thick concrete cap on the riser are spalled one to two inches deep. The reinforcing steel has been exposed in several areas and is heavily rusted.

3.1.4 Reservoir Area: No serious shoreline or gully erosion was observed.

3.1.5 Downstream Channel: The outlet pipe is in good condition and is functioning properly (Photo 4).

The stilling basin contains riprap, but significant erosion has occurred due to eddy formation on both sides of the outlet pipe. The most serious erosion is on the north side.

3.2 Evaluation

3.2.1 Dam: The following items should be accomplished as part of an annual maintenance program:

- 1) The trees growing on the embankment should be removed.
- 2) The footpaths on the upstream and downstream faces of the dam should be repaired and reseeded, or a type of stairway should be constructed to prevent future damage.
- 3) Continuous drainage should be restored along the berm on the downstream face of the dam by removal of sediment from the footpaths and regrading.
- 4) The animal burrows, particularly the burrow adjacent to the left seepage drain outlet, should be backfilled. The seepage drain outlet should be cleaned.

3.2.2 Appurtenant Structures: The trash racks should be inspected and debris removed periodically, particularly during the heavy rainfall seasons.

The stilling basin should be regraded, and new riprap should be installed.

NAME OF DAM: SOUTH RIVER NO. 27

All exposed steel parts of the riser should be cleaned and repainted on an annual basis.

The spalled concrete on the riser should be repaired due to the possibility that failure of these columns during a high stage situation could cause total blockage of the principal spillway.

3.2.3 Reservoir Area: Does not require further investigation.

3.2.4 Downstream Channel: Does not require further investigation.

SECTION 4 - OPERATIONAL PROCEDURES

- 4.1 Procedures: No formal operational procedures are used on South River Dam No. 27 since it is a flood control structure and does not require the use of water supply intake valves or gates. The reservoir under normal conditions remains at an elevation of normal pool of 1910.0 and has 32.7 feet of additional storage to the crest of the emergency spillway (1942.7).
- 4.2 Maintenance of Dam: Annual inspections are carried out through a joint effort of the S.C.S. and the U.S. Forest Service. The available reports are attached as Appendix V.
- 4.3 Maintenance of Operating Facilities: The slide gate is not routinely opened to check its functioning.
- 4.4 Warning System: At the present time there is no warning system or evacuation plan in operation. It is recommended that a formal emergency procedure be prepared, and prominently displayed and furnished to all operating personnel. This should include:
- 1) How to operate the dam during an emergency.
 - 2) Who to notify, including public officials, in case evacuation from the downstream area is necessary.
 - 3) Procedures for evaluating inflow during periods of emergency operation.
- 4.5 Evaluation: Maintenance of the operating facilities is considered adequate for the functions that they serve. However, operation of the lift gate should be instituted, perhaps as part of the annual inspections.

NAME OF DAM: SOUTH RIVER NO. 27

SECTION 5 - HYDRAULIC/HYDROLOGIC DATA

5.1 Design: The riser crest (elevation 1910.0) for the principal spillway was established at an elevation which would provide for 50 year sediment storage. The capacity of the principal spillway was established by consideration of a number of factors including:

- 1) The capability of evacuating the flood storage space within a reasonable period of time (10+ days).
- 2) Not passing damaging flows downstream.
- 3) The capability of the reservoir to store the flood waters.

The capacity of the principal spillway is 125 c.f.s. when the reservoir level is at the elevation of the emergency spillway crest (elevation 1942.7). The crest of the emergency spillway was established at the maximum elevation reached in routing the hydrograph resulting from the 100 year rainfall. The elevation of the top of dam (elevation 1950.0) was established by the maximum elevation reached in routing the hydrograph resulting from 2.5 x 6 hour point rainfall (29.5 inches) which produced a runoff of 21.9 inches. The 29.5 inches of rainfall used in the design is comparable to the Probable Maximum Precipitation (P.M.P.) as used by the C.O.E. and is therefore comparable to the Probable Maximum Flood (P.M.F.).

5.2 Hydrologic Records: None

5.3 Flood Experience: The June 1972 flood was approximately 0.6 foot deep in the emergency spillway, and the June 1969 flood was approximately 1.8 feet deep in the emergency spillway.

5.4 Flood Potential: Design features were established by the S.C.S. by routing the various hydrographs listed in Table 5.1. As shown in Table 5.1, the S.C.S. calculations contained values for peak elevation and inflow for the 100 year, 1.5 x 6 hour, and 2.5 x 6 hour hydrographs.

Apparently, the as-built emergency spillway is larger than the spillway size considered in the S.C.S. design. An actual spillway discharge rating based on as-built drawings and field information obtained during the inspection was calculated. Actual discharge capacities were determined to exceed design discharge data.

NAME OF DAM: SOUTH RIVER NO. 27

Therefore, peak outflows as listed in Table 5.1 correspond to actual discharge for each peak elevation listed. For this reason, peak outflow as listed for the emergency spillway hydrograph and the freeboard hydrograph exceed peak inflow in the calculations. In reality, the peak reservoir elevations for these routings would be less than those calculated by the S.C.S., because of the wider as-built spillway.

Peak inflow for the freeboard hydrograph was checked and determined to exceed peak inflow that would be computed according to Corps of Engineers standards for P.M.F. The actual discharges from the reservoir would exceed the discharges computed during design. Therefore, the larger as-built spillway provides an additional factor of safety against overtopping.

- 5.5 Reservoir Regulation: Pertinent dam and reservoir data are shown in Table 1.1, paragraph 1.3.3.

The regulation of flows from this reservoir is automatic. Water rising to an elevation above 1910.0 flows through the principal spillway and outlets through a 30 inch concrete conduit. In the event that the elevation of the crest of the emergency spillway (elevation 1942.7) is exceeded, water will then also flow past the dam through the ungated emergency spillway.

Outlet discharge capacity, reservoir area and storage capacity, and hydrograph peak inflow and maximum stage were obtained from reports and computations furnished by the S.C.S. Outlet discharge capacity was computed by backwatering various floods through the emergency spillway using data taken from as-builts and obtained in the field.

- 5.6 Overtopping Potential: The probable rise in the reservoir and other pertinent information on reservoir performance in various hydrographs is shown in the following table:

NAME OF DAM: SOUTH RIVER NO. 27

TABLE 5.1 RESERVOIR PERFORMANCE

Item	Normal	Hydrograph		
		Principal Spillway	Emergency Spillway	Free- board (a)
Peak flow, c.f.s.				
Inflow (b)	-	1520	5850	8800
Outflow (c)	-	125	6232	9200+
Peak elev., ft. M.S.L. (d)	1910.0	1942.7	1948.3	1950.0
Emergency spillway				
Depth of flow, ft.	-	-	5.6	7.3
Avg. velocity, f.p.s.	-	-	-	-
Non-overflow section				
Depth of flow, ft.	-	-	-	-
Avg. velocity, f.p.s.	-	-	-	-
Tailwater elev., ft. M.S.L.	-	-	-	-

(a) P.M.F. by C.O.E. standards.

(b) Inflow taken from S.C.S. data.

(c) Outflow taken from as-built spillway rating curve for peak elevation listed by the S.C.S.

(d) Peak elev. taken from S.C.S. data.

- 5.7 Reservoir Emptying Potential: With the reservoir level at the emergency spillway crest elevation, the principal spillway has a maximum discharge capability of 125 c.f.s. Considering the discharge as it varies with elevation, the total drawdown time from emergency spillway to principal spillway is approximately three days.

The reservoir can be drained from normal pool in approximately eight hours with the 30 inch slide gate open.

- 5.8 Evaluation: Hydrologic and hydraulic determinations as prepared by the S.C.S. appear reasonable. The dam and spillway are designed to pass a flood essentially equal to the P.M.F. which would be developed under standards used by the C.O.E. The project would pass 100 percent of the P.M.F. without overtopping the dam.

It should be indicated that conclusions pertain to present day conditions, and that the effect of future development on the hydrology has not been considered.

SECTION 6 - DAM STABILITY

- 6.1 Foundation and Abutments: The geologic report indicates that the valley floor is covered with resorted gravel and sand to a depth of five or six feet over metamorphosed shales. The impervious core key way penetrates the shale by not less than one foot. This bedrock is exposed in the shallow stream channel on the downstream side of the dam, southeast of the emergency spillway where an approximate bedding strike of N.60°E. and a dip of NW.45° were noted. Jointing at this location was not pronounced.

The right abutment is steep and consists of soil developed from schisty greenstones. According to the geologic report, the rock is firm and the dip (about 50°) is into the hillside and slightly upstream. Brown, weathered, sandstone is exposed near the toe of this abutment. The strata strike N.30°E. and dip NW.38°. Joints are present, spaced one foot apart, striking N.35°W. and dipping NE.83°. The left (or north) abutment consists of metamorphosed shale. The shale is thin bedded and brittle, with clay interfaces.

6.2 Stability Analysis

- 6.2.1 Visual Observations: No evidence of instability in the embankment or cut slopes was observed. No seepage was observed in the embankment, abutments or foundation that would suggest an unstable condition.
- 6.2.2 Design Data: Stability analysis was performed as part of the design of this dam (Appendix VII). This analysis, however, only checked the stability of the dam with respect to sliding along its base. A section through the downstream slope, showing the height of the dam to be 58 feet, was used and a phreatic surface was assumed. A submerged unit weight of 74 p.c.f. and saturated unit weight of 136 p.c.f. were estimated for the embankment soil. An angle of internal friction of 35 degrees was assumed for this cohesionless soil. The horizontal earth pressures were calculated using Rankine's Earth Pressure Theory and a coefficient of active earth pressure of 0.271. A safety factory of about four was computed.
- 6.2.3 Operating Records: The yearly inspections indicate no deteriorating conditions.

NAME OF DAM: SOUTH RIVER NO. 27

- 6.2.4 Post-Construction Changes: No alterations of the dam were apparent since it was constructed.
- 6.2.5 Seismic Stability: The dam is in Seismic Zone 2 and is considered to have no hazard from earthquakes according to the Recommended Guidelines for Safety Inspection of Dams.
- 6.3 Evaluation: Although no evidence of instability was observed during the visual inspection, the stability of this structure should be checked using the proper method. According to Section 4.4.3.2 of the Recommended Guidelines for Safety Inspection of Dams:

"The wedge method is generally applicable to rockfill dams and earth dams on foundations containing weak layers."

"The circular arc method is generally applicable to essentially homogeneous embankments and to soil foundations consisting of thick deposits of fine-grained soil containing no layers significantly weaker than other strata in the foundation."

According to the S.C.S. Design Report, the embankment was to be compacted of "compacted earth." The material from the spillway was "brittle shale with appreciable clay content." The foundation was not described as a weak layer in the Design Report.

It is recommended that the owner analyze the embankment by the circular arc method with soil parameters derived from existing soil data or from new sampling and testing.

NAME OF DAM: SOUTH RIVER NO. 27

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

- 7.1 Dam Assessment: The dam was designed to prevent overtopping under P.M.F. conditions. The data available was sufficient to evaluate the spillway capacity of the dam. A wedge type method of stability analysis was used for design; however, it is not appropriate for the design of a homogeneous earth embankment. The circular arc method should be used to check embankment stability according to Section 4.4.3.2 of the Recommended Guidelines for Safety Inspection of Dams.

The dam will not require urgent remedial treatment; however, the items listed below should be done as part of the annual maintenance inspection program.

With the exception of the circular arc stability analyses, further investigation of the dam will not be necessary.

- 7.2 Recommended Remedial Measures: The owner should accomplish the following items as part of the annual maintenance program:

- 1) The owner should immediately check the stability of the embankment using the circular arc method of analysis.
- 2) Repair the erosion (the footpaths) on the downstream face of the embankment by regrading and seeding, or by constructing a type of stairway to prevent future damage.
- 3) Remove the trees on the embankment.
- 4) Regrade and drain the berm on the downstream face of the dam.
- 5) Fill the animal burrows on the downstream slope of the embankment and prevent the animals from inhabiting the dam.
- 6) Clean the left seepage drain outlet.
- 7) Regrade the stilling basin and line with riprap.
- 8) Remove debris from the trash racks.
- 9) Clean and paint the exposed steel parts of the riser.

NAME OF DAM: SOUTH RIVER NO. 27

- 10) Repair spalled concrete on the riser to prevent a collapse and blockage of the principal spillway.
- 11) Annually check the operation of the slide gate on the riser.

A warning system should be devised that will alert downstream occupants to evacuate when the reservoir level approaches the top of the embankment. The downstream occupants should also be advised to evacuate during storms that coincide with the U.S. Weather Bureau's flash flood warning system.

NAME OF DAM: SOUTH RIVER NO. 27

APPENDIX I

PLATES

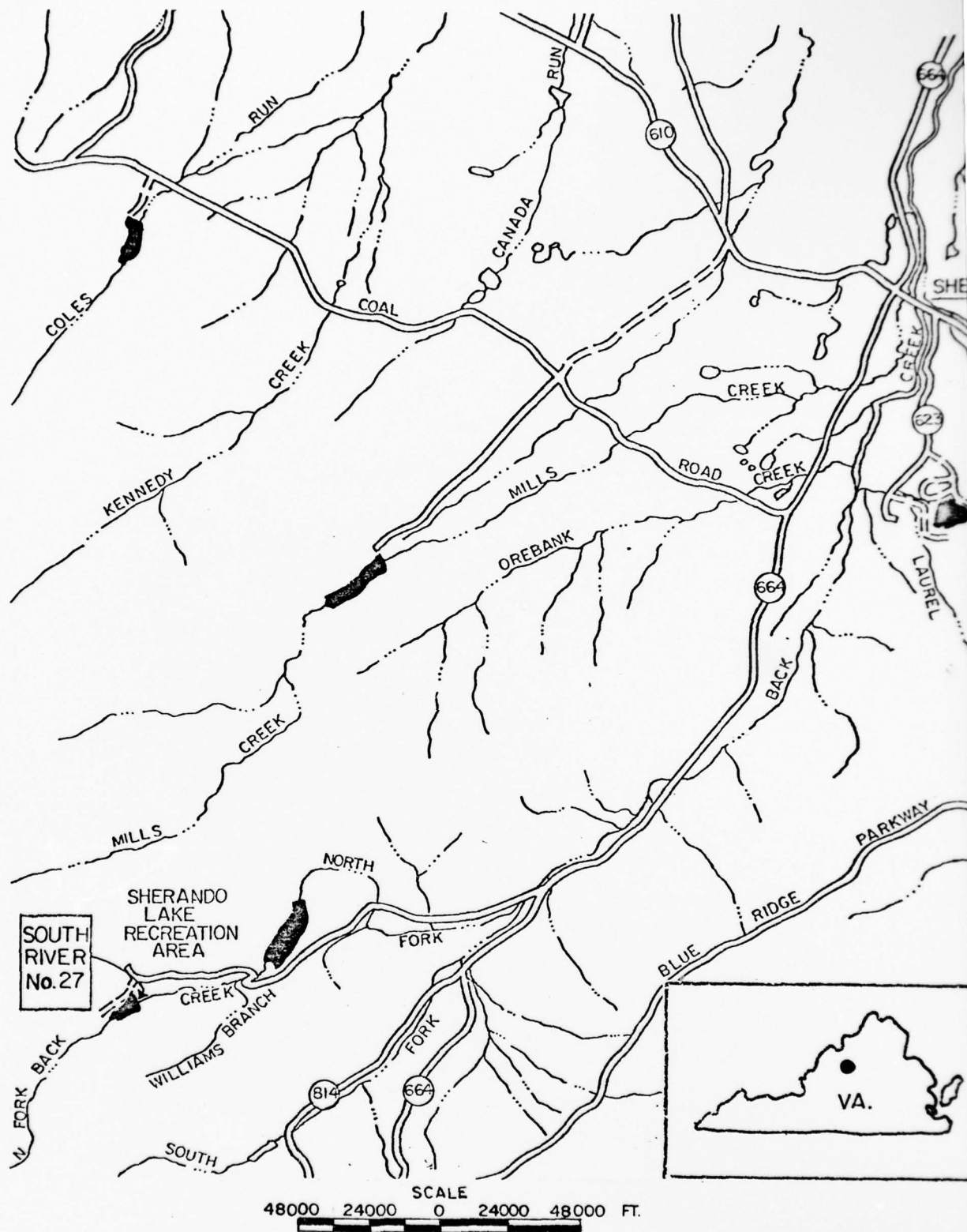
CONTENTS

Location Plan

Plate 1: Plan of Dam

Plate 2: Section Through Dam

NAME OF DAM: SOUTH RIVER NO. 27



LOCATION PLAN
SOUTH RIVER No. 27

APPENDIX II.

PHOTOGRAPHS

CONTENTS

Photo 1: Left Seepage Drain

Photo 2: Emergency Spillway

Photo 3: Riser and Reservoir

Photo 4: Outlet Pipe and Stilling Basin

Note: Photographs were taken 11 July 1978.

NAME OF DAM: SOUTH RIVER NO. 27

SOUTH RIVER DAM NO. 27



PHOTO 1. Left Seepage Drain



PHOTO 2. Emergency Spillway

SOUTH RIVER DAM NO. 27

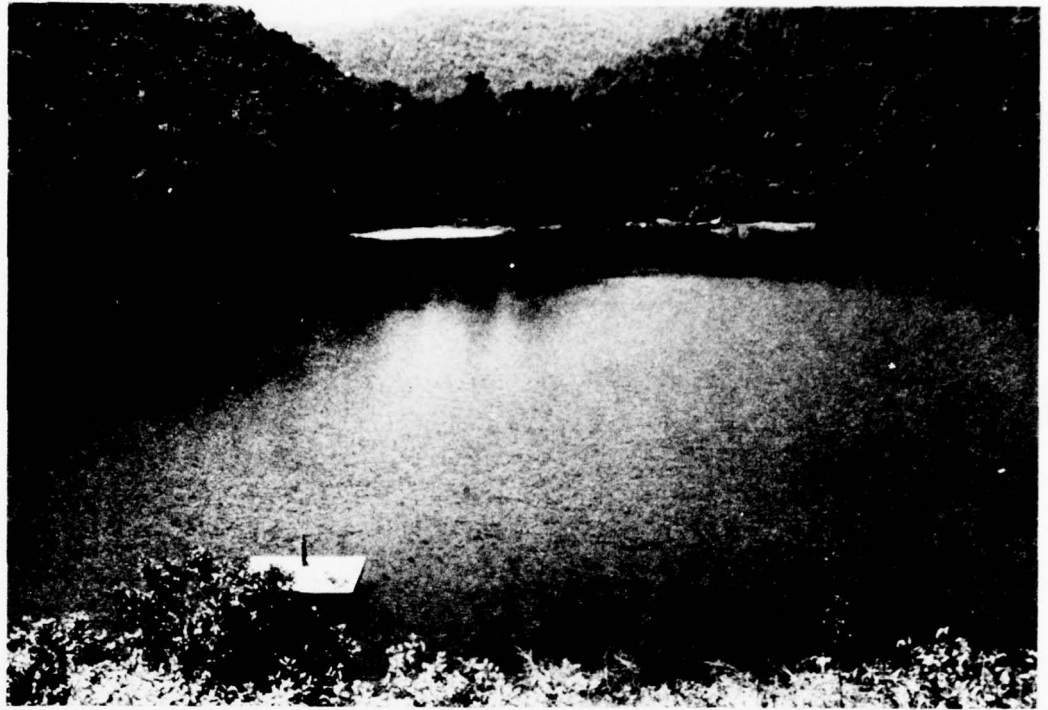


PHOTO 3. Riser and Reservoir



PHOTO 4. Outlet Pipe and Stilling Basin

APPENDIX III

CHECK LIST - VISUAL INSPECTION

Check List
Visual Inspection
Phase 1

Name Dam South River No. 27 County Augusta State Virginia Coordinates Lat. 3754.9
(Upper Sherando) Long. 7901.1

Date Inspection 11 July 1978 Weather Morning - Cloudy Temperature 60°-80° F.
Then Clearing

Pool Elevation at Time of Inspection 1910.2 M.S.L. Tailwater at Time of Inspection 1891.09 M.S.L.

HH-1

Inspection Personnel:

MICHAEL BAKER, JR., INC.: U.S. FOREST SERVICE:

Ed Brill
Michele Mill
David Hupe

Richard Graves

M. Mill Recorder

EMBANKMENT

South River No. 27

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
-----------------------	--------------	----------------------------

SURFACE CRACKS	No surface cracks were observed.	
----------------	----------------------------------	--

UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	No unusual movement or cracking at or beyond the toe was observed.	
---	--	--

SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES		
--	--	--

	<p>The dam appears to have been constructed with 2.5:1 slopes. No sloughing or severe erosion was observed. However, footpaths were observed on both faces of the dam that are eroding. Small trees were observed growing on both faces of the dam. Two large animal burrows were observed on the downstream face of the dam near the outlet conduit. Another animal burrow was observed adjacent to one of the seepage drain outlets. The bench on the downstream face of the dam does not appear to be draining properly.</p>	<p>The footpaths should be reseeded; the animal burrows should be filled in. The trees should be removed from the faces of the dam. The bench on the downstream face of the dam should be regraded or cleaned up to prevent ponding of surface water on the bench.</p>
--	---	--

HH-12

VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST		
--	--	--

	No bowing or bulging was observed. Elevations along crest varied from 1950.05 to 1950.75 (Michael Baker, Jr., Inc. level survey).	
--	---	--

RIPRAP FAILURES		
-----------------	--	--

	The riprap adjacent to the outlet works has been washed away and should be replaced.	
--	--	--

South River No. 27

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
FOUNDATION	Brown, fine grained sandstone is exposed at the downstream side of the south abutment striking N. 30° E., dipping NW. 38°. Joints are present spaced approximately one foot apart striking N. 35° W., dipping NE. 83°. Shale is exposed in the swale on the downstream side of the dam southeast of the emergency spillway striking N. 60° E., dipping NW. 45°. Jointing is not pronounced.	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	No seepage or erosion was observed at the junction of the embankment and abutment, and spillway and dam.	
ANY NOTICEABLE SEEPAGE	No seepage was observed.	
STAFF GAGE AND RECORDER	A water level gage is present on the northern shore of the lake.	
DRAINS	Eight inch seepage drains outletting on either side of the outlet conduit have been provided. The outlet for the seepage drain on the left (north) side of the outlet conduit has almost been completely covered over by an animal burrow. This seepage drain should be cleaned out. Water was flowing from the other seepage drain outlet at a rate of approximately one g.p.m.	Clean out left seepage drain.

OUTLET WORKS

South River No. 27

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	The concrete appears to be sound.	
INTAKE STRUCTURE H H - 4	Heavy spalling of columns supporting riser top slab.	Repairs should be made to stop corrosion of bare reinforcing steel in the riser.
OUTLET STRUCTURE	No problems, except for the erosion in the stilling basin.	
OUTLET CHANNEL	The meandering tree-lined channel shows only slight signs of erosion downstream of the stilling basin.	
EMERGENCY GATE	The emergency gate appears to be in satisfactory condition. However, the U.S. Forest Service representative stated that it is not periodically operated. A 30 inch diameter slide gate with an invert at elevation 1896.0 has been provided.	Operate periodically.

South River No. 27

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Not Applicable	
APPROACH CHANNEL	The approach channel is well-maintained with grass growing to a height of six inches.	Continue to maintain the approach channel in its present state.
DISCHARGE CHANNEL	Generally, the same as the approach channel. Where the discharge channel dumps into the immediate swale, the ground surface is very rough and would erode easily. However, bedrock is at shallow depth minimizing the amount of potential damage.	
BRIDGE AND PIERS	Not Applicable	

INSTRUMENTATION

South River No. 27

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	A steel pin at the south end of the dam crest at elevation 1950.0 is missing. A bench mark on the top of the water fountain approximately 200 feet downstream from the toe of dam is at elevation 1907.67.	
OBSERVATION WELLS	There are none.	
WEIRS	There are none.	
PIEZOMETERS	There are none.	
OTHER		

RESERVOIR

South River No. 27

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	The reservoir slopes appear to be steep and wooded. No sloughing was observed.	
SEDIMENTATION	Sedimentation is heaviest from the stream on the south end of the reservoir. Water depth measurements indicate that the emergency slide gate may be getting silted over. Since the slide gate is reported not to be periodically operated, this should be expected.	Operate the slide gate periodically.

DOWNSTREAM CHANNEL

South River No. 27

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	The downstream channel is wide, consequently, it has no problems. (The channel is 20 feet wide, with one foot banks, and then flows into a wide floodplain.)	
SLOPES	Slopes are steep due to erosion, but are not a danger to any structures.	
APPROXIMATE NO. OF HOMES AND POPULATION	30 campsites are located immediately downstream in the valley in addition to various picnic grounds. The receiving stream drains into Sherando Lake located immediately downstream. Sherando Lake is used for swimming, fishing and small-craft boating.	

APPENDIX IV

CHECK LIST - ENGINEERING DATA

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

South River No. 27

ITEM	REMARKS
------	---------

PLAN OF DAM	A complete set of as-built plans are available at the Norfolk District of the Corps of Engineers. A plan view of this dam is included in this report as Plate 1.
-------------	---

REGIONAL VICINITY MAP	The Location Plan is attached.
-----------------------	--------------------------------

CONSTRUCTION HISTORY	No construction history was available for this Phase I Inspection Report. The S.C.S. plans are dated 1957. Construction was completed in 1958.
----------------------	--

TYPICAL SECTIONS OF DAM	Typical sections are presented in the as-built plans. A typical section is included in this report as Plate 2.
-------------------------	--

HV-1

HYDROLOGIC/HYDRAULIC DATA	Hydrologic/hydraulic calculations were available for this Phase I Inspection Report.
---------------------------	--

OUTLETS - PLAN	
----------------	--

and

- DETAILS	are available at the Norfolk District.
-----------	--

- CONSTRAINTS	
---------------	--

and

- DISCHARGE RATINGS	are included in the S.C.S. design calculations and are available at the Norfolk District.
---------------------	---

RAINFALL/RESERVOIR RECORDS	
----------------------------	--

No rainfall or reservoir level records are available at the dam. Rainfall data is available from Virginia Climatological Records.

South River No. 27

ITEM	REMARKS
DESIGN REPORTS	Design calculations completed by the S.C.S. are available at the Norfolk District.
GEOLOGY REPORTS	Test boring data is included in the design documents. Locations of borings are indicated on plans, and data is represented on sections. A formal geology report was also available.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	Design computations for hydrology and hydraulics were completed by the S.C.S. Seepage studies were unavailable.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Test borings were done for materials investigations. Records are included in the design plans available at the Norfolk District. Laboratory soil test results are also available at the Norfolk District.
POST-CONSTRUCTION SURVEYS OF DAM	Previous inspections have been conducted by the S.C.S. District Conservationist. Present inspections are being conducted by the U.S. Forest Service.
BORROW SOURCES	The entire reservoir area below elevation 1910.0 (normal pool), the upstream valley, the emergency spillway, and the area directly north of the dam (now a group camping area) were borrow source areas.

South River No. 27

ITEM	REMARKS
------	---------

MONITORING SYSTEMS

The systems consist only of the inlet works.

MODIFICATIONS

There were none.

HIGH POOL RECORDS

U.S. Forest Service records discuss flood damage incurred prior to November 1969. No details are available.

IV-3

POST-CONSTRUCTION ENGINEERING STUDIES AND REPORTS

There were none.

PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS

There were none.

MAINTENANCE OPERATION RECORDS

Inspection and maintenance records are available with the U.S. Forest Service in Harrisonburg, Virginia. Erosion along the toe of the dam, a washed out section on the emergency spillway, and riprap repairs in the stilling basin were attended to in 1970. Clearing, seeding and fertilizing was completed in 1977 and 1978. Footpath damage repair and covering of the upstream berm with crushed stone was recommended in April 1978. These repairs have not yet been completed.

South River No. 27

ITEM	REMARKS
------	---------

SPILLWAY PLAN

SECTIONS

DETAILS

Plans, section and details are included in the design plans available at the Norfolk District. Capacity calculations were done by the S.C.S. which are also available through the Norfolk District.

OPERATING EQUIPMENT
PLANS & DETAILS

A slide gate is present on the riser. Details are included in the design plans.

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 1825 acres (2.85 square miles)

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 1910.0 (35.5 acre-feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 1942.7-100 year storm (558.5 acre-feet)

ELEVATION MAXIMUM DESIGN POOL: 1948.3

ELEVATION TOP DAM: 1950.0 (design)

CREST: Emergency spillway

a. Elevation 1942.7

b. Type Rock-cut side-channel

c. Width 160 feet

d. Length 360 feet

e. Location Spillover Left (north) side of dam

f. Number and Type of Gates None

OUTLET WORKS: _____

a. Type 30 inch prestressed reinforced concrete pipe

b. Location South of center of dam

c. Entrance inverts elevation 1910.0

d. Exit inverts elevation 1891.0

e. Emergency draindown facilities 30 inch diameter slide gate - invert elevation 1896.0

HYDROMETEOROLOGICAL GAGES: None

a. Type _____

b. Location _____

c. Records _____

MAXIMUM NON-DAMAGING DISCHARGE Unknown

Name of Dam: South River No. 27

APPENDIX V

ANNUAL MAINTENANCE INSPECTION REPORTS

ANNUAL MAINTENANCE INSPECTION OF FIVE COMPLETED FLOOD PREVENTION DAMS
Potomac River Watershed

April 16, 1968

DAM 77, Little North River (NEARTHSTONE LAKE):

Trees and stumps need to be removed from face of dam, and efforts to revegetate exposed areas need to be continued. This will be done by the Soil Conservation Service.

DAM 10, Skidmore Fork (TODD LAKE):

Locust bushes need to be cut from face of dam. This is the District's responsibility.

*Also need erosion protection on trails
DRK.*

DAM 76, North River (ELKHORN LAKE):

Logs, trees and stumps need to be removed from face of the dam. This is the responsibility of the City of Staunton.

DAM 27 at Sherando:

Need to cut locust brush, work with Forest Service on elimination of path on back and face of the dam, using a light tractor remove or replace rubble from outlet of primary spillway. This is the responsibility of the Forest Service.

DAM 10-A, MILLS CREEK: Is in good shape.

Inspections were made by David Walker (Supervisor of Shenandoah Valley Soil & Water Conservation District), Donald R. Kyle (U. S. Forest Service), and Wm. L. Blair, Jr. (Soil Conservation Service).

APPROVED:

E. W. Armstrong, Chairman
Shenandoah Valley SAWCD 4/ /68

U. S. Forest Service

Wm. L. Blair, Jr.
Wm. L. Blair, Jr.
Area Conservationist

DISTR: SVS&WCD (2 cys) ✓
USFS (2 cys) ✓
SCS State Office ✓
Area Office ✓
Augusta WUC ✓

File in Type II - 11-10-1970

7530

Shenandoah RECEIVED

MAY 6 1970

George Washington N. F.
Harrisonburg, Va.

SUPERVISOR
ADM. OFFICER
ENGINEERING
FIRE, REC.,
LANDS
PATTERNS
TIMBER MGMT.
W/L. RGN. WER.
VA. W/L. BIO.
ADM. SVS.
B. F. & RES.
PERSONNEL
FILES

Major work - repair of dam - completed. Structural works of repair
in the Shenandoah Valley - the first of the following needs of repair
prevalent were noted:

Site #1 - Shenandoah

Shenandoah basin needs clearing out, so that water level 2 to 3 feet
on section in this section of emergency spillway needs to be
and seeded. Washed out section approximately 1" deep, 40' long and 2'
(Forest Service indicated they would do their repair work.)

Site #25 - Toms Run

Cattle grazing needs to be controlled on dam and in emergency spillway.
Fertilizer on the emergency spillway would reduce the vegetation quickly
now if the grazing could be controlled.

Site #31

Trees need to be cut on dam and in emergency spillway. When cut the stumps
should be killed.

Site #32

Controlled grazing would improve the maintenance of this structure.

Site #33

Locust trees on dam and in emergency spillway need to be cut and killed.

Site #34

Locust trees on dam need to be cut and killed. Trash on river top needs to
be removed.

Site # 70 and 71

Locust trees on dam should be cut and killed.

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APPROVED:

David Walker

David Walker, Chairman
Shenandoah Valley S&WCO
April 6, 1970
May

V-2

Wm. L. Blair, Jr.
Area Conservationist
April 27, 1970

Wm. L. Blair
U. S. Forest Service
April 30, 1970

DAM MAINTENANCE INSPECTION REPORT

Ref: FSM 7572.23

1. REGION (3-4) 08	2. FOREST (5-6) 08	3. RANGER DIST. (7-8) 05	4. FOREST INV. NO. (9-12) 0005
5. NAME OF DAM Upper Sherando Lake			

BLOCK I - MAINTENANCE INSPECTION CHECKLIST

ITEM (Describe deficient items on attached sheets)	NEEDED REPAIRS (By priority)			ITEM (Describe deficient items on attached sheet)	NEEDED REPAIRS (By priority)		
	1	2	None		1	2	None
1. EMBANKMENTS				4. CLOSED CONDUITS			
a. Slumps, slides		✓		a. Settlement			✓
b. Settlement			✓	b. Displacement			✓
c. Cracks			✓	c. Cracks, spalls			✓
d. Seepage			✓	d. Seepage <i>Small amount of water in 6" Dia EAMP</i>			✓
e. Erosion		✓		e. Clogging			✓
f. Slope facing			✓	f. Erosion			✓
g. Debris		✓		g. Corrosion			✓
h. Traffic damage		✓		h. Joints			✓
i. Brush, trees		✓		i. Other			
j. Burrows			✓	5. SPILLWAYS			
k. Other				a. Obstructions			✓
2. CONCRETE STRUCTURES				b. Erosion			✓
a. Settlement			✓	c. Structural			✓
b. Overturning			✓	d. Vegetation			✓
c. Heaving			✓	e. Other			
d. Cracks, spalls			✓	6. DOWNSTREAM CONDITION			
e. Joints			✓	a. Backwater			✓
f. Undermining			✓	b. Erosion			✓
g. Drains			✓	c. Bars, pools			✓
h. Seepage			✓	d. Boils, piping			✓
i. Other				e. Other			
3. GATES, CONTROLS				7. RESERVOIR			
a. Corrosion			✓	a. Shore erosion			✓
b. Mechanical			✓	b. Debris			✓
c. Structural			✓	c. Sediment			✓
d. Clogging			✓	d. Other			
e. Access			✓	8. OTHER (Identify)			
f. Other			✓	a.			
				b.			
				c.			
				d.			

CARD NO. 12

(OVER)

V-3

7500-2 (2/69)

BLOCK II - MAINTENANCE COST ESTIMATE

ITEM OF WORK	UNIT	UNIT COST	QUANTITY		COST	
			PRIORITY 1	PRIORITY 2	PRIORITY 1	PRIORITY 2
1(a),(e) - Dam Needs fertilizer 5(b) + 5(d) - Spillway. + seeding			THIS PAGE IS BEST QUALITY PRACTICABLE FROM COPY FURNISHED TO DDC			
Ky 31-Tall Fescue (unhulled)	lb.	.50		300		\$150
Fertilizer 10-10-10	lbs	.15		4000		\$600
Labor	hr.	\$5.00		250		\$1250
1(g) - Clean up debris.	hr.	\$5.00		20		\$100
1(h) + 7(a) - need to construct hard surfacing for foot trails. (use Va #5 stone)	Tons	\$12.00		40		\$480
Labor [1(h) + 7(a)]	hrs.	\$5.00		600		\$3000
1(i) - Remove all brush & trees on Dam.	hrs.	\$5.00		320		\$1600
4(d) - need to check volume of water out of 6" dia cul.						
TOTALS (Enter in Block III, below)						7180

BLOCK III - SUMMARY MAINTENANCE INSPECTION REPORT

1. DATE OF INSP. (13) (18) 5/19/77 MO. DAY YR.		2. HIGHEST PRIORITY CHECKED IN BLOCK I. (19) ---		3. EST. MAINT. COST (\$1,000) a. PRIORITY 1 (20) (23) --- b. PRIORITY 2 (24) (27) 7.2	
4. EST. ENGINEER TIME NEEDED (MAN-HR.) a. PRIORITY 1 (28) (30) --- b. PRIORITY 2 (31) (33) 24		5. EST. AID & TECH. TIME NEEDED (MAN-HR.) a. PRIORITY 1 (34) (36) --- b. PRIORITY 2 (37) (39) ---			
6. NOTICE TO OWNER (40) YES --- NO		7. DATE OF NOTICE (41) (46) ---/---/--- MO. DAY YR.		8. LIMITATION (47) YES --- NO	
9. TYPE OF LIMITATION (48) ---		10. REVISED ESTIMATE OF INSPECTION TIME (MAN-HRS.) a. ENGINEER (49-50) --- b. FOREST OFFICER (51-52) --- c. AID & TECH. (53-54) ---			

CARD NO. 12

REPORTED BY (Name & signature)

Richard Brewer

V-4

TITLE

Civil Engr.

DATE

9-26-77

Operation and Maintenance Inspection

-2-

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Site #23 - Robinson Hollow - The vegetative cover is thinning out and the locust should be killed before they get out of control. The riser and pipe spillway are in good shape. The trash rack is scheduled to be replaced. The road in the emergency spillway should be watched as the ruts are hard to control. A mowing schedule should be followed. This site was overseeded with *Sericea Lespedeza* this Spring.

Site #26 - Inch Branch - The wooden trash rack is scheduled to be replaced. The pipe spillway and emergency spillway appear to be sound. The vegetative cover on the dam and emergency spillway is in satisfactory condition.

Site #19 - Waynesboro Nursery - This site has good vegetative cover except the cattle tracks which have become ruts should be healed over. The pipe spillway and emergency spillway appear to be sound. Thistle appear to be a problem on this dam and since they are dormant much of the winter they permit the soil when freezing and thawing to heave and then erode. A grass should be seeded in the thistle place after thistle have been eradicated.

On April 13, 1978, Sites 10A and 27 of the South River Watershed of the Potomac Watershed were inspected by Wayne Hypes, Folger Taylor, and William Lucas, Jr.

Site #10A - Mills Creek - This is a multiple purpose site so arrangements were made to meet with representatives from the Augusta County Service Authority but they did not show so we continued on the day's objective. The woody growth needs to be cut. It does not appear to have received any attention last year. The spillway pipe and riser appear to be in good shape. The emergency spillway is not showing much erosion but the cover is very sparse. The fill is taking a beating from abuse by off-the-road activities and the vegetation is being destroyed. The fill is also being rutted by attempting to have hill climbs when too wet. There should be toe drains re-established to eliminate the seep areas at the base of the dam. The borrow areas need seeding attention as well as some supervision by civil authorities of recreation pursuits. The ^{for road} areas are being abused.

Site #27 - Upper Sherando Lake - David Frazier, USFS, accompanied the inspection team on this dam. Much work has been carried out on this dam. The woody growth has been cut and destroyed. The dam has had 1200 lbs. fertilizer, 40 lbs. Ky 31 and 10 lbs. *Sericea Lespedeza* seed on it. The structure appears sound. The following suggestions came out of discussions with persons present to make for better use of the recreational potential:

1. The berm area be covered with crushed stone, here and on future dual-purpose structures.
2. New parking areas be established below dam with paths established using flattened logs or rail ties as steps.

Wayne M. Hypes
William E. Lucas, Jr.

APPENDIX VI

GEOLOGIC REPORTS

APPENDIX VII
STABILITY ANALYSIS

GEOLOGIC REPORT

POTOMAC RIVER BASIN FLOOD PREVENTION PROJECT
SOUTH RIVER SUB-WATERSHED
NORTH FORK BACK CREEK - SITE NO. 27

REPORT NO. VA 331 G

Prepared by G. Robert Hall
Geologist

G. Robert Hall

GENERAL FEATURES

Site No. 27 is located in mountain terraine. The valley floor is covered with re-sorted gravel and sand to a depth of 5 or 6 feet over metamorphosed shales. There are remnants of an outwash plain (terrace soils) on the north side of the valley. The material in these areas is stratified silty clay underlain by stratified sand and gravel containing an appreciable amount of silt and clay.

Underlying the valley floor and comprising the left (or north) abutment is a massive bed of metamorphosed shale. The right abutment is very steep, of a partially decomposed shell of quartzite underlain with hard, massive quartzite.

FOUNDATION CONDITIONS

The thickness of the soil mantle, both residual and alluvial, and the profile of the shale bedrock under the outlet tube was established by test pits. Location of the pits and logs of the subsurface material are plotted on the attached Geologic Data Sheets.

The residual soil mantle on the left abutment consists of about a foot of yellowish brown silty clay (low organic content) over weathered, grading into firm, shale. The shale is thin bedded, brittle, with clay interfaces. It appears to be metamorphosed but retains the characteristics of shale (as contrasted to a shist).

The right abutment is quite steep (100 percent slope) and consists of soil developed from shisty greenstones. The rock is firm and the dip (about 50°) is into the hillside and slightly upstream, thus minimizing the danger of slides or slips.

The alluvium on the valley floor is coarse textured and would be expected to transmit water freely. This material should be competent to support the earth fill and the cut-off wall penetrating one or two feet into the shale should eliminate unfavorable seepage through this material.

RESERVOIR

The trend of the formations is such that strata occurring in the reservoir extend upstream. Minor seepage into these strata would soon encounter sufficient resistance to halt the seepage flow. No piping or sink holes would be expected to develop.

Fourteen pits were dug to and into bedrock.

REFERENCE	U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE Prepared By: ENGINEERING & WATERSHED PLANNING UNIT UPPER DARBY, PENNSYLVANIA	DRAWING NO VA. 331 G SHEET 1 OF 8 DATE 8/16/56
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GEOLOGIC REPORT

POTOMAC RIVER BASIN FLOOD PREVENTION PROJECT SOUTH RIVER SUB-WATERSHED NORTH FORK BACK CREEK - SITE NO. 27

BORROW AREAS

The best material was found on the terraces which were highly dissected by the present stream. Upstream from the centerline of the dam for a distance of about 1600 feet in length and probably in the aggregate (considering both sides of the stream) averaging 200 feet wide, and with an average depth of 6 to 8 feet, there is roughly 75 to 100 thousand cubic yards of select borrow.

The material to come out of the spillway will be rather brittle shale with an appreciable clay content and will make suitable random borrow for the structure. It will not be as easy to work and may require more compactive effort than the select borrow.

SPILLWAY

The test pits in the spillway (S 1, S 2, S 3, S 4) disclosed about one foot of silty clay subsoil over shale. Experience has shown that this shale can be moved with a "ripper" and loaded into pans with no need for blasting.

The inclination of the shale beds (50°) will permit the use of steep spillway side slopes. These shales should be resistant to erosion and in weathered condition, with proper nutrients added, should support adequate vegetation.

CONCLUSIONS

Geologic conditions at Site No. 27 are favorable. The bedrock is sound and relatively impermeable. Suitable borrow is available within the site.

The spillway will be situated in moderately resistant rock.

No ground water (except in the alluvium) was encountered. No springs were observed within the site.

REFERENCE

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Prepared by
ENGINEERING & WATERSHED PLANNING UNIT
UPPER DARBY, PENNSYLVANIA

DRAWING NO.
VA. 331 G
SHEET 2 OF 8
DATE 8/16/56

GEOLOGIC - SOIL DATA

DATE 9/1/52

STATE Virginia COUNTY Appomattox WATERSHED Roanoke

NAME OF JOB N.E. 1/4 Sec. 23, T. 36 N., R. 12 E., S. 1 E. LOCATION Shenandoah National Park

TYPE OF JOB Field (Soil Profile Site NO. 27)

BENCH MARK 840.7 LOCATION Top of Hill

ELEVATION 840.7

STA. <u>51</u>			STA. <u>52</u>			STA. <u>53</u>			TYPICAL SECTION		
RT.-LT. OF <u>C</u> _____ FT.			RT.-LT. OF <u>C</u> _____ FT.			RT.-LT. OF <u>C</u> _____ FT.			STA. <u>249+23</u>		
EL. SURFACE <u>196.30</u>			EL. SURFACE <u>194.50</u>			EL. SURFACE <u>196.14</u>			NE RT. <u>12</u> FT.		
EL. SURFACE <u>196.30</u>			EL. SURFACE <u>194.50</u>			EL. SURFACE <u>196.14</u>			EL. SURFACE <u>224.31</u>		
1.25 ft. of topsoil			1.75 ft. of topsoil			1.30 ft. of topsoil			4.01 ft. of Loam		
2.25 ft. of loam			4.0 ft. of wet clay			2.25 ft. of loam			6.3 ft. of Wet Clay		
4.0 ft. of shale			4.0 ft. of shale			4.0 ft. of shale			4.0 ft. of Shale		
5.8 ft. of sand & gravel			5.8 ft. of sand & gravel			5.8 ft. of sand & gravel			5.8 ft. of Sand & Gravel		
5.7 ft. of sandstone			5.7 ft. of sandstone			5.7 ft. of sandstone			5.7 ft. of Sandstone		
Bottom of Hole			Bottom of Hole			Bottom of Hole			Bottom of Hole		

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INSTRUCTIONS: Give elevations where strata changes on left of column and nature of stratum with its depth on right of column representing same.

Draw core approximately to scale.

NAME _____

TITLE _____

HEADQUARTERS _____

APPROVED _____

GEOLOGIST

GEOLOGIC - SOIL DATA

SHEET 17 OF 19

DATE 5-2-51

STATE W. Va. COUNTY Putnam WATERSHED Putnam

NAME OF JOB Putnam LOCATION Putnam

TYPE OF JOB Soil NO. 223

BENCH MARK — LOCATION Putnam
ELEVATION 224.31

STA. <u>E 122</u>	STA. <u>B 121</u>	STA. <u>B-104</u>	TYPICAL SECTION STA. <u>249+23</u>
RT.-LT. OF <u>Q</u> <u>FT</u>	RT.-LT. OF <u>Q</u> <u>FT</u>	RT.-LT. OF <u>Q</u> <u>FT</u>	RT.-LT. OF <u>Q</u> <u>12</u> <u>FT</u>
EL. SURFACE <u>1911.0</u>	EL. SURFACE <u>1909.5</u>	EL. SURFACE <u>1921.0</u>	EL. SURFACE <u>224.31</u>
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><u>0.8</u> <u>Topsoil</u> <u>5 to 10 in.</u></p> <p><u>3.4</u> <u>reddish</u> <u>silty</u> <u>clay</u> <u>2 to 4 in.</u></p> <p><u>4.0</u> <u>reddish</u> <u>silty</u> <u>clay</u> <u>2 to 4 in.</u></p> <p><u>7.3</u> <u>reddish</u> <u>silty</u> <u>clay</u> <u>2 to 4 in.</u></p> <p><u>8.0</u> <u>reddish</u> <u>silty</u> <u>clay</u> <u>2 to 4 in.</u></p> </div> <div style="width: 45%;"> <p><u>0.8</u> <u>Topsoil</u> <u>5 to 10 in.</u></p> <p><u>1.1</u> <u>reddish</u> <u>silty</u> <u>clay</u> <u>2 to 4 in.</u></p> <p><u>2.0</u> <u>reddish</u> <u>silty</u> <u>clay</u> <u>2 to 4 in.</u></p> <p><u>2.2</u> <u>reddish</u> <u>silty</u> <u>clay</u> <u>2 to 4 in.</u></p> <p><u>2.4</u> <u>reddish</u> <u>silty</u> <u>clay</u> <u>2 to 4 in.</u></p> </div> </div>	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><u>0.8</u> <u>Topsoil</u> <u>5 to 10 in.</u></p> <p><u>1.1</u> <u>reddish</u> <u>silty</u> <u>clay</u> <u>2 to 4 in.</u></p> <p><u>2.0</u> <u>reddish</u> <u>silty</u> <u>clay</u> <u>2 to 4 in.</u></p> <p><u>2.2</u> <u>reddish</u> <u>silty</u> <u>clay</u> <u>2 to 4 in.</u></p> <p><u>2.4</u> <u>reddish</u> <u>silty</u> <u>clay</u> <u>2 to 4 in.</u></p> </div> <div style="width: 45%;"> <p><u>0.8</u> <u>Topsoil</u> <u>5 to 10 in.</u></p> <p><u>1.1</u> <u>reddish</u> <u>silty</u> <u>clay</u> <u>2 to 4 in.</u></p> <p><u>2.0</u> <u>reddish</u> <u>silty</u> <u>clay</u> <u>2 to 4 in.</u></p> <p><u>2.2</u> <u>reddish</u> <u>silty</u> <u>clay</u> <u>2 to 4 in.</u></p> <p><u>2.4</u> <u>reddish</u> <u>silty</u> <u>clay</u> <u>2 to 4 in.</u></p> </div> </div>	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><u>0.8</u> <u>Topsoil</u> <u>5 to 10 in.</u></p> <p><u>1.1</u> <u>reddish</u> <u>silty</u> <u>clay</u> <u>2 to 4 in.</u></p> <p><u>2.0</u> <u>reddish</u> <u>silty</u> <u>clay</u> <u>2 to 4 in.</u></p> <p><u>2.2</u> <u>reddish</u> <u>silty</u> <u>clay</u> <u>2 to 4 in.</u></p> <p><u>2.4</u> <u>reddish</u> <u>silty</u> <u>clay</u> <u>2 to 4 in.</u></p> </div> <div style="width: 45%;"> <p><u>0.8</u> <u>Topsoil</u> <u>5 to 10 in.</u></p> <p><u>1.1</u> <u>reddish</u> <u>silty</u> <u>clay</u> <u>2 to 4 in.</u></p> <p><u>2.0</u> <u>reddish</u> <u>silty</u> <u>clay</u> <u>2 to 4 in.</u></p> <p><u>2.2</u> <u>reddish</u> <u>silty</u> <u>clay</u> <u>2 to 4 in.</u></p> <p><u>2.4</u> <u>reddish</u> <u>silty</u> <u>clay</u> <u>2 to 4 in.</u></p> </div> </div>	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><u>4.01 ft.</u> <u>of Loom</u></p> <p><u>6.3 ft.</u> <u>of Wet Clay</u></p> <p><u>4.0 ft.</u> <u>of Shale</u></p> <p><u>5.8 ft.</u> <u>of Sand & Gravel</u></p> <p><u>5.7 ft.</u> <u>of Sandstone</u></p> <p><u>Bottom of Hole</u></p> </div> <div style="width: 45%;"> <p><u>EI. 220.3</u></p> <p><u>EI. 214.0</u></p> <p><u>EI. 210.0</u></p> <p><u>EI. 204.2</u></p> <p><u>EI. 198.5</u></p> </div> </div>

INSTRUCTIONS: Give elevations where strata changes on left of column and nature of stratum with its depth on right of column representing same.

Draw core approximately to scale.

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NAME _____

TITLE _____

HEADQUARTERS _____

APPROVED _____

GEOLOGIST

GEOLOGIC - SOIL DATA

DATE 7/1/50

STATE Vic COUNTY _____ WATERSHED _____

NAME OF JOB _____ LOCATION _____

TYPE OF JOB _____ NO. 27

BENCH MARK — LOCATION _____
ELEVATION 293.5
333

STA. <u>B 103</u>	STA. <u>B 105</u>	STA. <u>1100</u>	TYPICAL SECTION STA. <u>249+23</u>
RT.-LT. OF C _____ FT.	RT.-LT. OF C _____ FT.	RT.-LT. OF C <u>2.40</u> FT.	RT.-LT. OF C <u>12</u> FT.
EL. SURFACE <u>1918.0</u>	EL. SURFACE <u>1901.0</u>	EL. SURFACE <u>1903.8</u>	EL. SURFACE <u>224.31</u>
<div>17 pit</div> <div>2.0 ft. silty clay</div> <div>3.0 ft. red silty clay with some gravel</div> <div>4.0 ft. yellow silty sand somewhat with clay</div> <div>1.0 ft. brown clay</div>	<div>0.5 ft. silty clay</div> <div>1.0 ft. silty clay</div> <div>3.5 ft. gravelly little silty silty clay</div> <div>1.0 ft. shale</div>	<div>1.0 ft. silty loam</div> <div>3.0 ft. silty clay</div> <div>2.0 ft. gravelly silty clay</div> <div>1.0 ft. shale and gravel silty shale</div>	<div>4.01 ft. of Loam</div> <div>EI. 2203</div> <div>6.3 ft. of Wet Clay</div> <div>EI. 2140</div> <div>4.0 ft. of Shale</div> <div>EI. 2100</div> <div>5.8 ft. of Sand & Gravel</div> <div>EI. 2042</div> <div>5.7 ft. of Sandstone</div> <div>EI. 198.5</div> <div>Bottom of Hole</div>

INSTRUCTIONS: Give elevations where strata changes on left of column and nature of stratum with its depth on right of column representing same.

Draw core approximately to scale.

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TITLE _____

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GEOLOGIST

GEOLOGIC - SOIL DATA


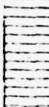
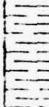

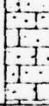
DATE 8/1/54

STATE V COUNTY _____ WATERSHED _____

NAME OF JOB _____ LOCATION South River

TYPE OF JOB _____ NO 27

BENCH MARK LOCATION _____
ELEVATION _____

STA. <u>54</u> <u>4+50 R</u> RT. - LT. OF C _____ FT. EL. SURFACE <u>1956.3</u>			STA. <u>#3</u> <u>08+90</u> RT. - LT. OF C _____ FT. EL. SURFACE <u>1932.5</u>			STA. <u>B 152</u> <u>12</u> RT. - LT. OF C _____ FT. EL. SURFACE <u>1940.0</u>			TYPICAL SECTION STA. <u>249+23</u> <u>NE</u> RT. - LT. OF C <u>12</u> FT. EL. SURFACE <u>224.31</u>		
	<u>1.0 ft</u> <u>yellow</u> <u>clay</u>			<u>1.0</u> <u>yellow</u> <u>clay</u>			<u>1.0 ft</u> <u>yellow</u> <u>clay</u>		<u>El.</u> <u>220.3</u>		<u>4.01 ft.</u> <u>of Loom</u>
	<u>1.3 ft</u> <u>reddish</u> <u>clay</u>			<u>0.5 ft</u> <u>reddish</u> <u>clay</u>			<u>1.2 ft</u> <u>reddish</u> <u>clay</u>		<u>El.</u> <u>214.0</u>		<u>6.3 ft.</u> <u>Wet Clay</u>
							<u>1.2 ft</u> <u>green</u> <u>clay</u>		<u>El.</u> <u>210.0</u>		<u>4.0 ft.</u> <u>Shale</u>
									<u>El.</u> <u>204.2</u>		<u>5.8 ft.</u> <u>Sand & Gravel</u>
									<u>El.</u> <u>198.5</u>		<u>5.7 ft.</u> <u>Sandstone</u>
											<u>Bottom of Hole</u>

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INSTRUCTIONS: Give elevations where strata changes on left of column and nature of stratum with its depth on right of column representing same.

Draw core approximately to scale.

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GEOLOGIST

GEOLOGIC - SOIL DATA

DATE 8/2/50

STATE IL COUNTY WATERSHED

NAME OF JOB LOCATION

TYPE OF JOB NO. South River - 27

BENCH MARK LOCATION
ELEVATION

Picch. way (1+15) STA. <u>249+23</u> RT.-LT. OF C <u>2017</u> FT. EL. SURFACE <u>1897.6</u>		Picch. way STA. <u>200(3+15)</u> RT.-LT. OF C <u> </u> FT. EL. SURFACE <u>1574.4</u>		STA. <u> </u> RT.-LT. OF C <u> </u> FT. EL. SURFACE <u> </u>		TYPICAL SECTION STA. <u>249+23</u> NE RT.-LT. OF C <u>12</u> FT. EL. SURFACE <u>224.31</u>	
Water at 9 ft.	0.5 ft Silt loam	Water at 27 ft.	0.5 ft Silt loam			El. 220.3	4.01 ft. of Loam
	1.0 ft silty clay		1.0 ft silty clay			El. 214.0	6.3 ft. of Wet Clay
	4.5 ft. gravel & cobble		5.5 ft. gravel & cobble			El. 210.0	4.0 ft. of Shale
	Rock chale.		Rock chale			El. 204.2	5.8 ft. of Sand & Gravel
						El. 198.5	5.7 ft. of Sandstone
						Bottom of Hole	

INSTRUCTIONS: Give elevations where strata changes on left of column and nature of stratum with its depth on right of column representing same.

Draw core approximately to scale

NAME

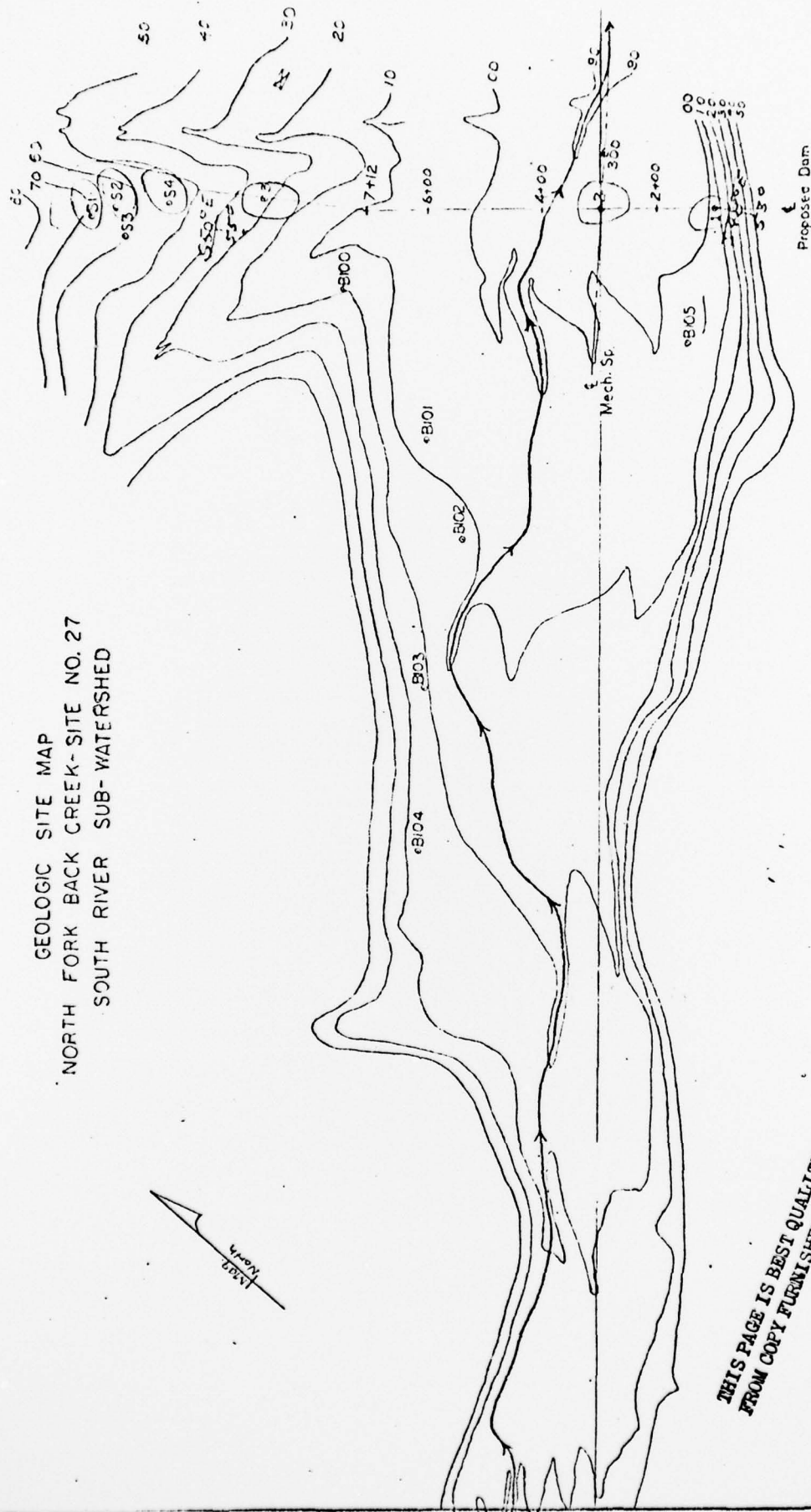
TITLE

HEADQUARTERS

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GEOLOGIST

GEOLOGIC SITE MAP
NORTH FORK BACK CREEK-SITE NO. 27
SOUTH RIVER SUB-WATERSHED



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SCALE 1" = 200'

REFERENCE

U. S. DEPARTMENT OF AGRICULTURE.
SOIL CONSERVATION SERVICE
ASSISTING

DRAWING NUMBER
VA. 331 G

SHEET 8 OF 8 SHEETS

DATE 5/1/55

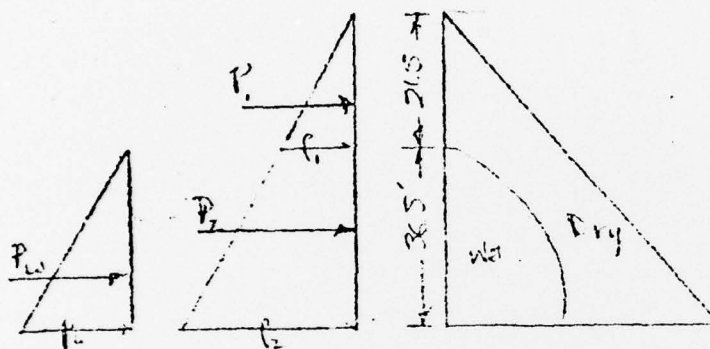
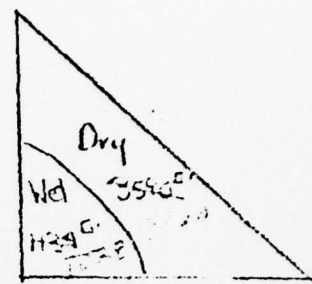
DAM STABILITY ANALYSIS

Assume 1' slice

Dry Area : 3520 Sq Ft
Wet Area : 1089 Sq Ft.

$\gamma_{moist} = 136 \#$ $\gamma_{saturated} = 74 \#$

$\theta = 90^\circ$
 $\phi = 35^\circ$
 $Z = 0$
 $c = 0.271$



$$P_1 = 0.271 \times 21.5 \times 136 = 792.4 \#$$

$$P_2 = 0.271 \times 36.5 \times 74 = 1524.4 \#$$

$$P_3 = 62.4 \times 36.5 = 2277.6 \#$$

$$V_1 = \frac{3520}{2} \times 136 = 473120 \#$$

$$V_2 = \frac{1089}{2} \times 74 = 80512 \#$$

$$P_1 = \frac{21.5}{2} \times 792.4 = 8518 \#$$

$$P_2 = \frac{36.5}{2} (792.4 + 1524.4) = 42282 \#$$

$$P_3 = \frac{36.5}{2} (2277.6) = 41566 \#$$

$$\tan \phi = \tan 35^\circ = 0.70021$$

$$R = \sum V (\tan \phi) = 400,629 \#$$

$$H = P_1 + P_2 + P_3 = 92,366 \#$$

$$\frac{R}{H} = \frac{400,629}{92,366} = 4.34 > 2$$

O.K.

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